

REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Claims 12, 22 and 30 have been canceled.

Claims 10, 13, 14, 21 and 23 have been amended.

In the Advisory Action dated March 28, 2003, the Examiner agreed with Applicants' argument, in the Amendment After Final filed March 21, 2003, that the cited references of Koerner et al. (U.S. Patent No. 5,478,780), Chang et al. (U.S. Patent No. 5,043,299) and Takebayashi et al. (Japanese Patent Publication No. 63-000480 A) do not teach or fairly suggest the limitations as recited in pending claims 12-20 and 22-23.

The Examiner stated that such rejections are not appropriate, and as such, the Examiner lifted the 35 USC 103(a) rejections of claims 12-20 and 22-23. Claims 12-20 and 22-23 now stand objected to in the application.

In view of the Examiner's statements in the above Final Rejection and Advisory Action, applicants submit the foregoing Second Amendment After Final, in which, claims 12 and 22 have been canceled, and the limitations thereof included into independent claims 10 and 21, respectively. Claims 13, 14 and 23 have been

amended to merely correct for dependency. Applicants have further canceled independent claim 30, and as such, submit that the rejection of claim 30 is now moot.

No new matter has been added.

Applicant respectfully submit that independent claims 10 and 21 are now directed to an apparatus and system for selectively forming a metal silicide over a semiconductor substrate having a chamber 50 comprising a plurality of interior chambers including at least one interior chamber 10 for cleaning the substrate surface by removing oxide therefrom while under a continuous vacuum, and at least one interior chamber 30 for depositing a metal, wherein the wafer is transferred from the cleaning chamber 10 to the deposition chamber 30 within chamber 50 under continuous vacuum throughout the chamber without breaking such vacuum. The chamber also includes at least one workpiece holder to hold a substrate, having silicon and insulator portions on a surface thereof, with an oxide layer thereover, and a heating element for forming the metal silicide only over the silicon portions of the substrate surface. The chamber has at least one line 52, i.e., a first line, operatively connected between the chamber and a pump for evacuating and maintaining the entire chamber at a continuous vacuum, particularly, prior to and during cleaning of the substrate surface. The chamber 50 also has at least one input line 22, i.e., a second line, for introducing a cleaning agent into the chamber for the purpose of removing any oxide on the surface of the substrate while in the continuous vacuum,

and at least one output line 24, i.e., a third line, to remove the cleaning agent and the removed oxide from the chamber. The chamber 50 also has a reactor within the chamber 50 for depositing a metal onto the cleaned silicon and insulator portions of the substrate surface while within the continuous vacuum. An etchant enables removal of unreacted metal from over the insulator portions, thus selectively forming metal silicide on portions of the substrate.

Applicants continue to submit that both Koerner et al. and Chang et al. are directed to systems having separate, independent processing chambers connected by intermediate bodies.

Koerner et al. discloses a system having high-vacuum chambers of chambers 1-6, a high-vacuum distributor chamber 7 and high-vacuum supply chambers 8, 9 all connected by a central distributor chamber 7. (Fig. 1, col. 4, lines 42-47.) This central distributor chamber 7 is insulated from and independent of chambers 1-6 and the supply chambers 8, 9. (Fig. 1 and col. 4, lines 47-51.) Koerner et al. further discloses uniform formation of silicides across the surface of the substrate by providing a substrate in a chamber 1, which, has only an input line of Ar gas and no output line for removing the cleaning agent and the removed oxide. As a result, any removed oxide remains within chamber 1 and therefore may be redeposited thereon the substrate surface.

Chang et al. discloses two separate, distinct processing chambers, i.e., cleaning chamber 10 and CVD chamber 40, that are connected to each other by an

air-tight passageway 70. (Fig. 2, col. 2, lines 64-67.) The passageway has a first slit valve 82 that wafer 100 is admitted through to enter the passageway and a second slit valve 84 that the wafer passes through to exit passageway 70 and enter CVD chamber 40. (Fig. 2 and col. 3, line 58-63.) This passageway 70 also has a vacuum pump 90 via pipe 78 for maintaining a pressure in the passageway and an entrance port 74 through which one or more non-oxidizing gases may be flowed into passageway 70 via pipe 76. (Fig. 2 and col. 4, line 1-15.) In accordance with Chang et al. a wafer 100 is cleaned in chamber 10, passes through passageway 70 and then into CVD chamber 40 having a heater 45 to heat the wafer during deposition of tungsten using a mixture of a tungsten-containing gas and a reducing gas flown into chamber 40 via pipe, showerhead 52, 50. (Fig. 2 and col. 5, line 21-30.) An exit port 54 connected to vacuum pump 90 maintains a pressure in CVD chamber 40. (Fig. 2 and col. 5, line 18-20.)

Takebayashi et al. is merely cited for the limitation of a heating element external to the chamber. It does not disclose or even suggest an apparatus, as is currently claimed, for selective formation of a silicide on a substrate surface whereby the apparatus comprises a heating element and a chamber having at least one interior chamber 10 for cleaning the substrate surface by removing oxide therefrom while under a continuous vacuum, and at least one interior chamber 30 for depositing a metal, wherein the wafer is transferred from the cleaning chamber 10 to the deposition chamber 30 within chamber 50 under continuous vacuum throughout the

chamber without breaking such vacuum, in addition to, a first line connected to a pump to evacuate and maintain the chamber at a continuous vacuum, a second line for introducing a cleaning agent into the chamber, a third line for removing the cleaning agent and removed oxide, and a reactor -all within the chamber. Accordingly, applicants submit that the Takebayashi et al. does not overcome the deficiencies of the Koerner et al or the Chang et al. references, alone or in any proper combination thereof.

As both Koerner et al. and Chang et al. are directed to systems having separate, independent processing chambers that are connected by a central distribution chamber 7 or a passageway 70, respectively, it is submitted that neither Koerner et al. nor Chang et al., alone or in combination, disclose or suggest an apparatus as is instantly claimed. In particular, neither Koerner et al. nor Chang et al., alone or in combination, disclose or suggest an apparatus including a heating element and a chamber, whereby the chamber comprises a plurality of interior chambers with at least one interior chamber adapted to remove oxide from the substrate surface while under a continuous vacuum, and at least one interior chamber adapted to deposit a metal on the substrate surface while under the continuous vacuum. Further, applicants submit that neither Koerner et al. nor Chang et al., alone or in combination, disclose the chamber having a first line for evacuating and maintaining a constant vacuum therein, a second line for introducing a cleaning agent into the mainframe chamber and a third line for removing the cleaning agent

and any removed oxide from a substrate surface, thereby providing such substrate with a substantially oxide-free surface. As such, neither reference, alone nor in combination, discloses that a chamber under constant vacuum may have therein a cleaning chamber and a deposition chamber for selective formation of a metal silicide on a substrate surface. As the Japanese patent to Takebayashi et al. is only cited for the limitation of a heating element external to the chamber, applicants submit that Takebayashi et al. does not overcome the deficiencies of Koerner et al. or Chang et al., alone or in any combination.

For the reasons as discussed above, applicants submit that neither Koerner et al., Chang et al. nor Takebayashi et al., alone or in any proper combination thereof, render obvious the instant invention, as such references do not teach all the structural limitations as instantly claimed. See, Ex parte Masham, 2 U.S. Patent No. Q 2d 1647 (Bd. Pat. App. & Inter. 1987). It is respectfully submitted that the instant invention of a main chamber containing within a plurality of processing chambers all under a continuous vacuum is structurally different from that which is disclosed in the cited prior art references. The instant invention is structurally different from the systems disclosed in Koerner et al., Chang et al. and Takebayashi et al., alone or in any proper combination thereof, such that, the above cited references, alone or in any combination, do not render obvious pending claims 10, 13-21 and 23-29.

It is respectfully submitted that the application has now been brought into a condition where allowance of the case is proper. Reconsideration and issuance of a

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Notice of Allowance are respectfully solicited. Should the Examiner not find the claims to be allowable, Applicants' attorney respectfully requests that the Examiner call the undersigned to clarify any issue and/or to place the case in condition for allowance.

Respectfully submitted,


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